Dery Wells

CABOT CORPORATION, OXIDES DIVISION TUSCOLA, ILLINOIS

APPLICATION FOR PERMIT TO DISPOSE OF HYDROCHLORIC ACID IN ST. PETER SAND

RECEIVED

DEC 13 1965

DIVISION OF SANITARY ENGINEERING ILLINOIS DEPT. OF PUBLIC HEALTH

EPA Region 5 Records Ctr.

298913

Prepared By:

W. M. Sargeny, JV/ Registered Professional Engineer

Texas No. 20276

### INDUSTRY

Cabot Corporation has a plant located three (3) miles west of Tuscola, Illinois, manufacturing a finely divided silicon dioxide. This product is sold under the trade name Cab-O-Sil\*. This very versatile material is used as a rubber reinforcing agent, an "anti-crawl" additive to plastics, an anti-settling agent in paints, and a flatting agent in varnish, as well as a gelling agent in printing inks. It adds non-sticking qualities to insecticide dusts, insulating qualities to electrical equipment and is a coating for paper.

The plant employs some 36 people and is currently being expanded.

The Corporation is also the world's leading carbon black manufacturer and is engaged in oil and gas development and production in the Southwest.

A by-product of the process at the Tuscola Plant is hydrochloric acid.

During the next calendar year Cabot will lose their present contract sales of this product. Cabot will attempt, and expects, to sell most of this acid on the open market. However, in the event Cabot is unable to sell all of the acid produced we desire to dispose of any surplus into a suitable subsurface formation. Cabot proposes to do this by drilling and completing a deep disposal well, in a suitable formation, on, or adjacent to, the company's property at Tuscola.

### LOCATION

Proposed location for the disposal well is 1745 feet north and 2120 feet west of the southeast corner of Section 31, Township 16 North, Range 8 East of the Prime Meridian, Douglas County, Illinois. Location is in the SE/4 of Section 31 on land owned in fee by Cabot Corporation.

\*U.S. Reg. Pat. Off.

### VOLUME

Cabot Corporation proposes to dispose of up to 35,000 gallons per day of waste at the current time. It must be realized this amount will be disposed of only in the event Cabot is unable to sell any of the product. The Company believes the well will be used infrequently in emergency circumstances only.

### CHARACTERISTICS OF WASTE

Waste to be disposed of is Hydrochloric Acid with a gravity of 20° Baume. There is a trace of suspended solids (silicon dioxide) in the acid. This will not pose a disposal problem.

### DISPOSAL FORMATION AND FORMATION WATER

Cabot Corporation is considering use of the St. Peter Sand for disposal.

The St. Peter appears to have sufficient porosity and permeability to accept waste fluids at reasonable pressures.

The St. Peter is an Ordivician sandstone expected to be found at a depth of about 3,800 feet. The sand is expected to be some 150 feet thick in this area and is a fine to medium grained white sand. The St. Peter is overlain by approximately 600 feet of dolomites and limestones and some 200 feet of impervious Maquoketa Shale. These formations would prevent the upward migration of fluids from the St. Peter.

Analysis of water for the St. Peter Sand some seven (7) miles northeast of the proposed disposal well indicates the water is not potable. It contains some 10,000 to 12,000 ppm Chlorides and total solids of 19,000 to 22,000 ppm. The water had an odor of H<sub>2</sub>S (hydrogen sulphide).

### PROPOSED WELL CONSTRUCTION

Attached is a sketch of the proposed well plan. It is Cabot's intention to seal off all fresh water strata with steel casing cemented back to the surface. We anticipate this surface casing to be set at approximately 500 feet.\* The well will be drilled through the injection horizon and the injection string of casing cemented in place at the top of the disposal horizon.

The bottom 200 to 300 feet of injection casing will be epoxy fiberglass pipe. Cement used will be common ordinary oil field cement followed
by enough phenol-formaldehyde plastic cement to surround the fiberglass
pipe.

The injection section will be open hole. Injection will be through 2" epoxy fiberglass tubing set at the bottom of the casing. Annular space between tubing and casing will be filled with diesel oil for corrosion protection of the steel casing.

Instrumentation will be provided to detect leaks in any pipe string immediately. Upon detection of a leak in any string of pipe, injection of waste material will cease and the tubing and casing will be flushed with fresh water before repairs are started.

### WELL OPERATION

Based upon available information, we believe injection will be done with a vacuum at the surface on the injection tubing. Normal operation would be for an electrically operated solenoid to open a valve on the acid supply line upon a high level signal from the acid storage tank. This

valve will close automatically upon a low level signal from the acid storage tank.

Because of specific gravity differentials between the acid, formation brine, and oil in the tubing-casing annulus the annulus will always be under a positive pressure at the surface. Pressure sensing instruments on the annulus and tubing will constantly monitor pressures. A variation of pressure exceeding present limits will automatically close in the tubing, thereby stopping injection, and alert the plant operator by means of an alarm system. Plant operator will immediately flush all acid from the well by injecting fresh water down both the tubing and annulus. Sufficient water will be injected to completely clear the tubing of acid and the annulus of diesel oil so that repairs may be made.

In the event pressure is required to inject the acid, the annulus will be isolated from the tubing pressure by means of a packer. This will allow leak detection by means of variations in pressure differentials as before. Flushing will be done as previously stated before repairs are begun.

Pressures that will be required to dispose of the waste material are unknown at this time. Cabot believes the disposal will be done under a vacuum. However, in the event pressure is required it will be held as low as possible. In no event would it exceed the parting pressure of the formation (roughly equivalent to 1/2 psi per foot of depth).

### DEEP WELLS IN VICINITY

PUMP PRESSURE

There are several fresh water wells in the vicinity (less than one

mile) of proposed location. These wells are all relatively shallow (less than 200') and will not be subject to contamination.

The nearest oil wells are some two miles southwest of the proposed location. These wells produce from the Spar Mountain Sandstone at a depth of about 1,600 feet and will not be subject to contamination by the proposed disposal system. See Page 12

### LOGS OF OTHER WELLS IN THE AREA

Driller's logs of a well drilled by Panhandle Eastern Pipe Line Company in Section 35-T16N-R7E are included. This is the nearest deep well to the proposed location although it did not penetrate the St. Peter formation. Also attached is the driller's log of the Ohio Oil Company's Lewis Shaw No. 1 well in Section 36-T16N-R8E, which penetrated the St. Peter and Mt. Simon. This is the nearest well to penetrate the St. Peter.

### APPLICATION FOR DRILLING PERMIT

Attached. See Page 15, 16 & 17

### DESIGN PLANS

Attached. See Page 10 & 11

### DRILL CUTTINGS AND WATER ANALYSIS

Drill cutting samples and water analyses from formations tested will be submitted to the Illinois State Geological Survey.

# SPECIFICATIONS FOR HYDROCHLORIC WASTE DISPOSAL INJECTION WELL

### GENERAL

The drilling and completion of this waste disposal well shall be done by rotary tools under contract to Cabot Corporation. All operations will be under the supervision of a member of Cabot's engineering staff.

### DRILLING

The Driller shall drill a hole from the ground surface to a depth of 200 feet below the bottom of the lowest potable ground water formation, as determined by electric logging during course of drilling. Potable water is defined as that containing no more than 5000 ppm total dissolved solids. It is estimated that the depth of the surface hole will be about 500 feet. The surface hole shall have a diameter of 12-1/4 inches.

After the hole is cased and cemented, the driller shall drill a well hole 7-7/8 inches in diameter, through the overlying strata into and through the St. Peter Sand. It is estimated that the St. Peter Sand will be found at a depth of about 3800 feet and that the bottom of the hole will be at a depth of 3950 feet below the surface of the ground.

All drilling shall be performed by a rotary drill using a mud slurry drilling fluid. The Driller shall keep an accurate log of all essential data during his drilling operations, and shall furnish a daily record of the progress of the work. He shall collect and retain washed, or bailed, samples of the drill cuttings from such cuttings as will be indicated by the geologist. The Driller shall procure from the State Geological Survey, Urbana, a sufficient number of

sacks and identification tags for samples of cuttings, and two driller's log books for the well. All well tailings shall be disposed of on the site as directed by the Engineer. The Driller shall provide a temporary cap for the well during all periods of temporary shutdown of the work.

In the event the Driller fails to sink the well to the depth specified or to a lesser depth, as may be ordered by the Engineer, or should the well be abandoned for any reason, the abandoned hole shall be filled with mud and concrete.

### LOGGING

The following logging services are contemplated at this time.

- 1. For the surface hole:
  - (a) Induction-Electrical log.
  - (b) Formation Density log.
  - These logs will be used to determine the resistivity of the connate water in the rock formations and will indicate the presence or absence of fresh water.
- 2. Upon completion of drilling the 7-7/8" diameter well to total depth:
  (a) Induction-Electrical log.
  - (b) Gamma Ray-Sonic-Caliper log, for showing porous, permeable zones and for determining the hole size for computing the volume of cement required for cementing.

### FORMATION TESTING

1. Formation Fluid Sampling - Samples of fluid from the proposed disposal formation will be withdrawn from the proposed disposal formation during completion of the well. Formation fluid samples will be submitted to the Illinois State Geological Survey. Analyses of the samples shall be submitted to the Illinois State Sanitary Water Board. 2. <u>Drill Stem Testing</u> - Drill stem tests of the St. Peter Sand, and other likely disposal zones drilled, will be taken in order to determine pressures prevalent in each reservoir, rock properties, and to secure formation fluid samples. These tests will be made in open hole before the casing is placed.

### CASING

- Surface Casing Surface casing shall be 8-5/8" OD; 24 lb. per foot, new seamless steel pipe.
- 2. Long String Casing Long string casing shall consist of 300 feet of 4-1/2 OD fiber-glass epoxy heavy duty pipe and approximately 3500 feet of 5-1/2 OD, 15.5 lb. per foot, J-55, new seamless steel pipe. The entire string shall be long enough to reach from the surface to the top of the St. Peter Sand. The bottom of the casing string shall extend some 10 to 25 feet below the top of the St. Peter Sand when installed in the well. The pipe shall have threaded ends and shall be jointed by screwed couplings.

### **CEMENTING**

Cementing, or grouting, of the annular space surrounding each casing string shall be done under pressure with the spaces completely filled, applied from the bottom of the casings and forced up to the ground surface. Cementing shall be in such manner that the entire filling of the annular spaces will be completed.

Surface casing shall be cemented with Class A Portland cement with suitable accelerator. Cement slurry shall be pumped down the casing. Displacement shall be with a wiper plug and mud. The casing shall be centered by centralizers.

Long string (5-1/2") casing shall be cemented for the full length of pipe. Cement shall be Class A Pozmix, salt saturated, with friction reducer and a sufficient amount of formaldehyde-phenol plastic cement to cover the epoxy fiber-glass casing. Cement shall be pumped down the casing string and displaced with a wiper plug and mud. A sufficient number of centralizers shall be used for centering over the entire length of the casing string.

### INJECTION TUBING

Disposal shall be through 2" EUE fiber-glass epoxy pipe set approximately at the bottom of the long casing string.

### WELL-HEAD STRUCTURE

Upon completion of the well, Cabot will construct a well-head structure as shown on the attached drawing. Said structure shall be of concrete or asphalt surrounded by a ditch one foot deep and two feet wide containing crushed limestone.

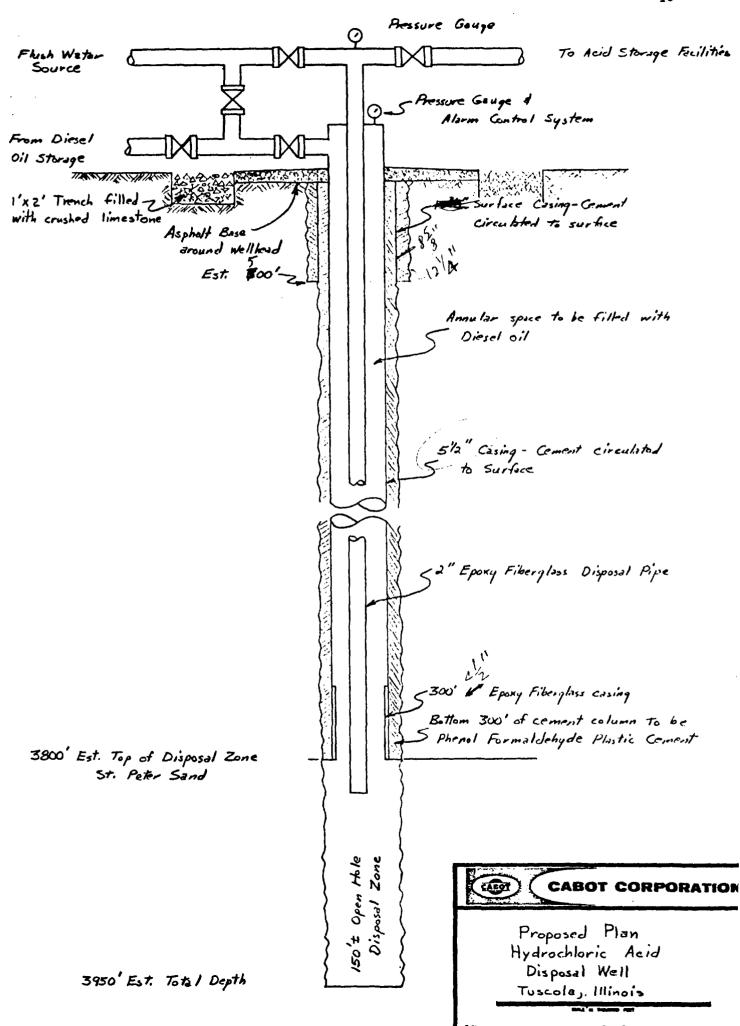
### ACID STORAGE

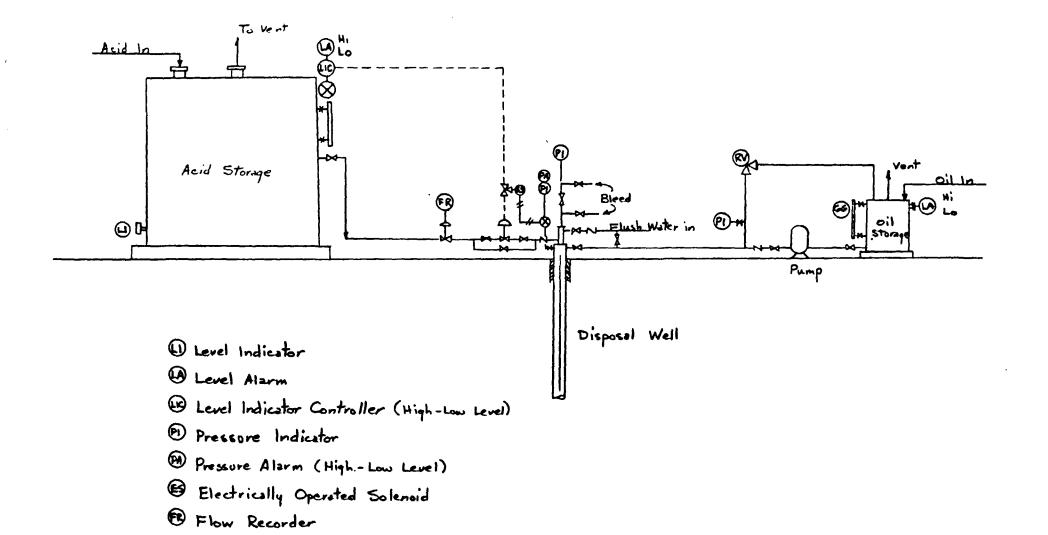
Storage for 380,000 gallons of acid (about 20 days' production) shall be provided at the plant site. Storage shall be in a rubber lined steel tank set upon a concrete base.

### TRANSFER PIPING, FITTINGS AND CONTROLS

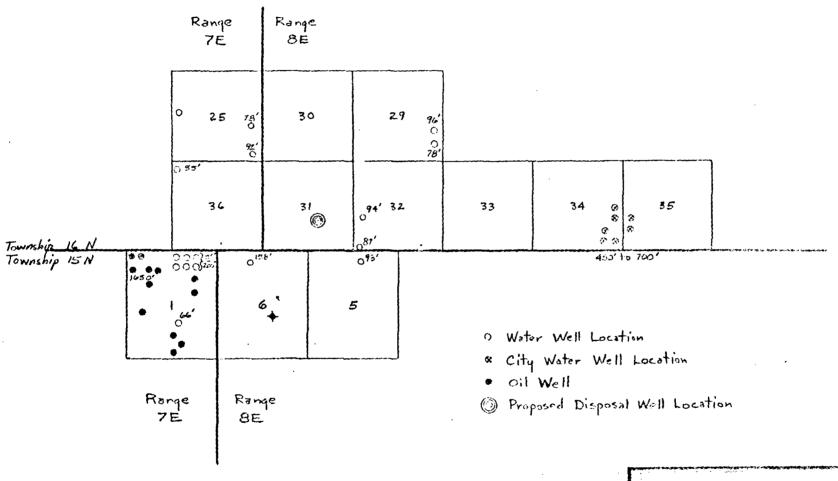
All acid piping shall be either poly-vinyl-chloride plastic pipe or epoxy fiber-glass pipe. Connections and valves shall be of the same material as the pipe where possible. Where necessary metallic equipment will be rubber or plastic lined or coated. All control instruments coming in contact with acid shall be protected by coating with rubber or plastic.

Piping and controls shall be as indicated on the attached drawing.





# Proposed Well Connection Hydrochlaric Acid Disposel Tuscola, Illinois



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### DISPLACEMENT CALCULATIONS

### ST. PETER SAND

### Assumptions

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1. Displacement will be uniformly radial over the entire sand thickness.

2. Porosity of 20%.

- 3. Connate water saturation of 30%.
- 4. Reservoir rock saturated with brine initially.

### Calculations

Displaceable Volume/Acre Foot

V = (7758 Bbl/Acre Foot)(0.20 porosity)(1 - 0.30 displaceable volume)

- = 1,086 Bb1/ac.ft.
- I. Assume disposal of 20,000 gal/day for 100 years and sand thickness of 50 feet.
  Volume to be injected = 20,000 gal/D/42 gal/bbl X 36,500 = 17,380,952 Bbl.
  Reservoir Volume Displaced = 17,380,952 Bbl/1,086 Bbl/ac.ft. = 16,000 ac.ft.
  Reservoir Areal Acres Displaced = 16,000 ac.ft./50 ft. = 320 acres.

- II. Assume disposal of 20,000 gal/day for 100 years and sand thickness of 25 feet. Reservoir Areal Acres Displaced = 16,000 ac.ft./25 = 640 acres. Radius of Area Displaced =  $8,874,063^{1/2}$  = 2,979 ft.
- III. Assume disposal of 20,000 gal/day for 100 years and sand thickness of 100 feet.

  Reservoir Area Displaced = 16,000 ac.ft./100 = 160 acres.

  Radius of Area Displaced =  $2,218,516^{1/2} = 1,489.5$  ft.

### ESTIMATION OF POSSIBLE INJECTION RATE

### ST. PETER SAND

### Assumption:

Effective injection thickness of sand	100 feet
Radius of well bore, (Rw)	0.33 feet
Permeability (k), darcies	0.1
Viscosity (u), cp	1
Static Bottom Hole Pressure, (Pp)	1600 psi
Depth to top of St. Peter	3800 feet
Maximum assumed radius of injection, (R <sub>p</sub> )	2640 feet
Specific gravity of waste	1.16
Injection with zero pressure at surface	

Bottom hole injection pressure

$$P_W = (0.433 \text{ psi/ft})(1.16)(3800 \text{ feet}) = 1910 \text{ psi}$$

Injection Rate

$$Q = (7.07)(k)(h) \left[ \frac{P_e - P_w}{u \ln R_e/R_w} \right]$$
$$= (7.07)(0.1)(100) \left[ \frac{1600 - 1910}{1 \ln (2640/0.33)} \right]$$

= 2,443 bbl/day or 71.2 GPM

STATE OF ILLINOIS Sanitary Water Board Springfield, Illinois

Fill In All Blanks

(Signature of Applicant  (Signature of Mayor, Are.  ATTESTED (Date)	(Signature) PPROVAL (SAMITARY DISTRICTS WHERE	Vice President - Culti Conformation  Pitle: Owner, Installer, or Agent  12/1/65  N'is President - Cult Conformation  (Title)  (Clerk)  REQUIRED LOCALLY, ETC.) DATE  (Title)
(Signature of Applicant  FOR OPERATION APPROVAL  (Signature of Mayor, Are.  ATTESTED (Date)	(Signature)	Vice President - Cult Conforation  Pitle: Owner, Installer, or Agent  12/1/65  Vice President - Cult Conforation  (Title)  (Clerk)
(Signature of Applicant  (Signature of Mayor, Free	sident, etc.)	Vice President - Culit Conforation  Pitle: Owner, Installer, or Agent  12/1/65  Vice President - Culit Conforation  (Title)
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FOR CONSTRUCTION APPROVAL	or Agent)	Vice President Conformation Pitle: Owner, Installer, or Agent
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	ment works additions will be opera Regulations of the Sanitary Water I	ted or supervised by a duly qualified sewage works Board.
Sewage Treatment Works: B	by indicating their approval hereo	n the signers hereby attest that the proposed treat-
	tor provided by or approved by the	
	=	ewage treatment works have adequate capacity for the thermore, that the installation shall be made under
		m sanitary sewer lines to be made tributary to the
. Sewer Lines: By indicatin	ng their approval hereon the signe	rs hereby attest that they have ascertained that the
PROJECT APPROVAL		
Hydrochloric Acid in	St. Peter Sand	BEING MADE A PART HEREOF.
SAID PLANS CONSISTING OF	. Wol Hitzionster	pplication for Permit to Dispose of
(Name of Engineer) ACTING AS MY AGENT (DELETE IF	4. M. Las Sh. I	(Illinois Registration No.) exas Registration No. 20276
( William )	F. Blank	, 20592
	entify point of connection or disc PANYING PLAYED AND SPECIFICATIONS P	ate depth of 3800' below ground surface
		ate depth of 3800' below ground surface
AND Cabot Corpor	cation, Tuscola, Illinois lity, Corporation, Address)	TO OPERATE
Tuscola, Illinois	ribe briefly the sewage works for	which application is made)
(Dance	acid disposal facilities	at Cabot's Cab-O-Sil plant 3 miles west o
Deep well hydrochloric		( <b>Address)</b> Tate of Illinois for the issuance of a permit to install
hereby makes application to t Deep well hydrochloric	14.00m + 1	Tuscola, Illinois
Deep well hydrochloric	ion	(Municipality, etc.)

The application shall be signed as follows:

- a. For construction within the limits of a municipality, the application shall be signed by the installer and by a municipal official, and attested by the clerk. If municipally owned, the municipal official will sign as the owner regardless of location.
- b. If the proposed facilities are privately owned and located outside a municipality, the owner or responsible officer of the organization shall sign the application and obtain signature of a proper official of the agency responsible for operating the installation.

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- 1. "Sewage Works" means individually or collectively those constructions or devices used for collecting, pumping, treating, and disposing of sewage, industrial waste or other wastes, (or for the recovery of by-products from such sewage, industrial waste or other wastes.)
- 2. "Municipality" means Sanitary District and/or similar governing agencies.

## HAINOIS GEOLOGICAL SURVEY, URBANA

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Strata	ilidet ac s	Гер	Bultois
Drift		0	90
Ponnsylvanian			
Shalo, gayy	- 1	90	110
Line	j	110	120
Shale, red and green	j	120	160
Shale, limy	1	160	170
Lima, brown		170	180
Sample description			
Sandstone, light gray, fine, limy		180	183
Sandstonn, light gray, fine slightly			
micaceous		183	245
Sandstene, above; a lightle black platy	shald	245	255
Shale, gray, soft	- 1	255	280
Shale, gray, soft; some black shale; tr	ace	·	
of lime		280	319
Millersburg:			
limestone, white, donso		319	348
Limostone, ton, sandy	1	348	355
Shale, dark gray micaceous		353	335
Sandstone, light gray, fine, limy		385	400
Shalo, greenish-gray and reddish-gray		400	450
Shale, black platy; a little limestone,	High	٤ .	
brown	•	450	465
Shalo, gray soft, micaccous, sandy		465	480
Sandstone, white, medium fine, sub-angu	lar	430	503
Shale, gray, limy		505	510
Sandstone, white, well comented angular		510	520
Limestone, ten to light brown, dense		520	550 ,
Limestone, above; some shale, gray		550	590
Shale, gray, trace of limes		580	620
	tan	620	635
Limestone, ten, somewhat chorty		635	645
Shalo, gray limy		645	660
	بعاديون العوا	1	وسنسوب برا

COMPANY	Panhandlo Eastorn	Pipolino Co.
FARIA	Phillips	110. <b>1</b>
DATE DRILLED	August 1957	COUNTY NO. 439
AUTHORITY	D. W. Straight	•
ELEVATION	6751 KB - Company	
LOCATION	300'S line, 300'E	lino of the St
COUNTY	DOUGLAS	

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Yop	Botto:	Strata Thicknoo	Тор	Bottom
Schle, gray, sout, muddy		660	740	Shale, greenish-gray and red; some limpston		
Shale, black; shale, gray; sandstone,	i i			tan	1379	1415
white; trace of coal		740	750	Ronnult:		·
Limastone, tan to gray		750	770	Limestone, brown, dense	1415	1420
Sandstone, light gray, fine, somewhat	[ ]			· Shale, groonish-gray, platy; some red shale		
limy	]	770	870	trace of limestone	1420	1430
Limestone, buff, dense	}	870	E <b>90</b>	Limestone, brown dense	1430	1435
Shale, black	{	. 88 <b>0</b>	890	Aux Vases:		} ;
Shale, light gray, sandy and Hamy		890	950	Limestone, brawn, dense; some sandstone,		
Shale, black; limestone, tan; taace of	coal	950	970	light gray, shaly	1435	1440
Shalo, gazy, limy	{	970	980	Shalo, red and green; some sendstone, Algh		1
Limostone, tan to gray; chale, black;				gray, fio	1440	1448
trace of coal	! !	980	990	St. Genevieve-Levias:	ļ	] · :
Chalo, gray; a little lines bno, buff		530	1010	Dolomite, white, very fine crystaline;		}
Shale, gray and dark gray; limestone,	ໄລກ	1010	1020	slight porosity, oil stain and		
Shale, gray; a little limestone, tan	i i	1020	1020	flousosence 1455-61	1448	1470
Shale, black; a little limestone, tan	1 1	1030	1091	Limostone, brown, dense	1470	1485
Limostono, white to light brown, hard	0.000 <del>=</del>			Limestone, tan, very fine crystalline, che		1505
shat sandy	1	1001	1103	Limistone, tan <u>colitic</u>	1505	1520
Shale, black	j	1103	1120	Rosiciaros	ł	
Shale, gray to dark gray; comembat lim	7		A = = 15	Limistone, light gray to light brown, dosn	0	
and sandy		1120	1258	to slightly colltic	1520	1541
IMSSISSIPPIAL - Choster	1 1		•	Limostone, brown dense, slightly colligic	1541	1570
Darlows	1			Limpstone, light gray, very fine crystal-		
Limestone, white to light become chest	ሃ			ino, somewhata charty; trace of gypsum	1570	1601
trace of sand	1	1253	1276	Saleas	1	
Limestone, ten, dence, trace of sand;	1	1.5014	1000	Limestone, light brown, dense	1601	1610
somo shale, daek gray		1276	1290	Limostone, light tan to brown fine		
Cycycsa:	ł	1000	1000	crystallino fossiliferous, no flouredence		1.00
Sandstone, white, fine, limy and shaly	<b>1</b> i	1290	1332	(Microlog gazosity 1614-18; 1624-26)	1610	1530
PaintGreak:	ļ			Limostone, light gray to thite, fine	1,000	1,4,5
Limestone, white to tan, dense; chale,	groc			cyastalline; trace of chert	1630	1640
gray and some red	,	1332	1340	Limestone, gray, dense, argillaceous	1640	1645
Shalo, grounish-gray and red; come lin	pston			Limestone, gray; chert, tan to gray	1645	1650
ton	}	1040	1360	Shalo, gray, limy	1650	1660
Renolst:	}	1015	1040	Limestone, gray, dense to finely crystalli	B) 1000	1690
Sandstone, light gray, very fine, liny	1	1260	1365	Shale, gray, liny	1690	1720
Shala, gray; coma limaatona, ten		1345	1373	Shale, gray, silty to sandy; trace of red	1720	1775
Panhaadto Bastern Pipelina Co.		Pallip	5 // 1 ····	Paring of the factor Pipeline Co.	illities ?	
comity POCCIVA		35-1611		COUNTY LOUGLAS	35 (61)-7	
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ILLINOIS GEOLOGICAL SURVEY, URBANA

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ILLINOIS GEOLOGICAL SURVEY, URBANA

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Strata	Thickness	Тор	Bottom	Strata Thickness Top	Bottons.
Shale, as above; some limestone, white		1775	1820	Dry and abandoned. Plugged August 22, 1957	
Skhale, gray, silty, to sandy; trace				2 1 79 170	
of red shale		1820	1690	Casing: 7" - 179' with 135 sacks cement.	
Shale, gray-green and red, silty; trac				1 0 0 100 100	
limestone, tan	1	1690	1910	S.S.#30460	
Shale, gray, limy and somewhat sandy	1 1	1910	1975	Plant to the City of	
Shale, green-gray to gray; a little li	ಣ-			Electric log filed	. :
stone, white to pink	) }	1975	1980	Microlog filed	-
Shale, gry, milty and sandy; a liattle	1 1			Driller's log filed	
red shalo	1 1	1980	2005	Time log filed.	•
Limestone, gray, shaly; a little sands	tone,				
fine	1 . 1	2003	2015		
Shale, gray-groon silty; tome limeston	p, tan		2070		
Sandstone, gray, shaly		2070	2115		٠.
Shale, gray, sandy	1	2115	2195		
Shale, gray, sandy; a little shale gra	A-Gree				
and black	1	2195	2220		:
Sundstone, light gray, fine, silty	1 1	2220	2234		
Shale, gray-green and black	1 1	2234	2240		•
Sandstone, light gray, fine silty	}	2240	2250		
Shale, gray-green and black; a little	ł †				
rod shale	l.,	2250	2295		
Dolouite, light gray, very fine crysta		2295	2302		
Sale, gray-green and gray; some limest	pne,				
tan		2302	2322		
May Alban Y:	} }				-
Shale, black and green		2322	2364		
Shale, gray; a little limestone, tan	1.1	2364	2380		.*
Limestone, light brown to tan, dense s	para	2350	2802		
HATHOVED			]		
Dolomite, tan to brown, crystallino; c	nort		0.00		
white		2402	2435		
Limestone, tan to brown, finely crysta		2433	2445		
Limestone, white finely crystalline; a	1 1	04:5	1		
little chert	l l.	2445	2460		
Limestone, tan, finely crystalline, im	boageh				
graine	1	2460	2465	1)	
Dolomito, white with scattered sand gr	pined	2465	2500		
Panhandlo Eastern Pipolino Co.	p	hillip		Panhandle Eastern Pipoline Co. Phillips #	1
COUNTY		5-1611-		COUNTY COUGLAS 35-16H-7E	•
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Streta	Thickness	Tep	Dottors	Strata	Thickness	Тор	Softon
Cable Tools	1		, r	Dolomite, white to gray, very fine,			
Studied by E. P. Dubois, 1944.	1 1		ŀ	dense.	7:0	•	375
No samples	40		1,0	Dolomite, argillaceous, greenish, gray	i. 1	,	
EVONIAN SYSTEM				very fine.	15		390
Limestone, buff, silty, fine to very	1 1		Ì	Dolomite, argillaceous, silty, graying			
fine, slightly petroliferous.	5		145	green, very fine, granular, little		:	
Limestone, buff, white, medium to				dolomite, gray, fine, dense.	35		425
coarse, crystalline, very fossilifer-	1 1		}	Siltstone, very colomitic, green.	20		445
ous.	5	•	50	Dolomite, white to gray, fine, cil			
Dolomite, silty, brown, fine, granular	1 - 1			stained, cherty.	10		455
petroliferous, porous.	10		60	Dolomite, very silty, grayich-green,			722
Colomite, silty, brown's gray, very				very fine, granular; cherty; little		,	
fine, granular, partly sandy.	13		73		100		555
Dolomite, partly sandy, gray, brown,	-			Limestone, part very silty, dolomitic			
extra fine, partly petroliferous.	7		80 1			4	500
Same, but very dense, more sandy.	15		95	green, little pink, buff, very fine.	25		580
Dolomite, silty to sandy, gray, buff,	1			Same: shale, calcareous, reddish-	130		<b>600</b>
extra fine.	35		130	brown.	10		590
Same, to sandstone, delomitic, buff,	"		1)0	Limestone, argillaceous, silty, weak,			100
gray, fine, medium (last 5 feet).	15		115	pink, red, green, very fine, medium.	30		620
SILURIAN SYSTEM	12		140	Limestone, light buff, red fossil.	امدا		أمرار
Niczaran Series	) 1	* *	1	casts, lithographic.	25		645
-			<b>j</b> '	Same, partly argillaceous, greenish,	أمسا		
Dolomite, gray, fine, medium, crystall			165	pinkish.	25		670
ine.	20			Limestone, buff, pink casts, very			
Same, sandy, cherty.	10		175	fine, very coarso.	35		705
Dolomite, cherty, brown, buff, very	100		27.0	Alexandrian Sories	i 1		. :
fine.	35		210	Limestone, partly argillaceous, partly			
Dolonite, cherty, gray, buff, very	1,01		ا مرم	glauconitic, brown, white, very fine,			
fine.	40		250	pyritic, very finely sandy.	10	•	715
Dolomite, brown, very fine, petrolif-			704	Same, and brown.	10		725
erous.	35		285	ORDOVICIAN SYSTEM	1 1		. ;
Dolomite, white, brown, fine, very fir			204	Maquoketa Formation			. 1
slightly petroliferous.	20		305	Siltstone and shale, calcarcous, gred	n.15		740
company The Chic Oil Company		است	<del></del>	Shale, silty, tough, green; siltstone	,		į
FARM Shem, Lewis No.	7	<u> </u>		argillaccous, green, tough (inter-	) }		
DATE DRILLED January 1945 COUNTY NO.				bedded).	55		795
AUTHORITY E. P. Dubois	• • •			Shale, as above; limestone, argillace			
ELEVATION 656' GrdCo.		[44]		ous, brown, mottled, fossiliferous.	27		822
LOCATION 330' S line, 330' W line, of	Soc.		1 1 1 1 1 1 1		<u></u>		7,5
county. Douglas S.S./11355	000	36_	16::-8E	The Chie Oil Company	Shar	i, Lovis	
ورورهند ۱۱۹۵۹ ماهند والمعادية			-VII - UU	, county Douglas S.S./11355		36-16n	-OTZ
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Strata	Thickness	Тор	Bottom	Strate	Thickness	Тор	Bottom
Limestone, mottled, white, black,				lithographic, fine.	15		1200
coarse, fossiliferous.	8		830	Dolomita, brown, buff, very fine, fin			l
Shale, very calcareous, brownish-			1	partly earthy; limestone, as above.	16		1216
green: limestone, very argillaceous	1 (		1	Limestone, gray, lithographic to very			1
brownish- green.	20		850	fino.	9		1225
Shale, calcareous, gray, very fossil-	1 I		1	Same, and brown.	8		1233
iferous; some limestone, fossilif-			}	Limestone and dolomite, buff, litho-	i. i		1
erous, brown.	25		875	graphic, very fine; shale, brown.	42	•	1275
Shale, calcareous, gray, some browni	sh-	•	}	Limestono and dolomite, as above.	45		1320
gray.	72		947	Polonite, buff, brown, fine, very	. 1	•	1
Kirmswick limestone	1 1			fine.	25		1315
Limestone, buff to brown, very fine,			1	Same; limestone, buff, lithographic.	55		17100
fossiliferous.	6		953	Limestone, gray, fossiliferous, fine;			
Limestone, buff, very fine, some			1	shale, gray, red streaks; limestone,			1
fine, nedium; some clay partings	42		995	brown, lithographic.	16	•	1416
Same, fossiliferous; little flour 5				Limestone and dolomite, brown, little		•	,
at 1010'.	35		1030	gray; partly argillaceous, conglom-	1	٠.	
Limestone, buff, brown, nedium,				eratic, very fine.	9		11125
fossiliferous.	66		1096	Dolomite, brown, very fine.	12	•	1437
Limestone, brown, extra fine; brown,	1 1			Same; limbstone, brown, lithographic.			11/1/2
shaley partings.	4		1100	Polomite, as above.	20		1465
Plattin limestone	1 1			Dolomite, partly arigillaceous, brown		2	
Limestone, argillaceous, gray, extra	) ;			green, very fine.	10		1475
fine, fossiliferous; shale, grayish	4 i			Joachim-Dutchtown Formations	ļ j		
green.	7		1107	Dolomite, buff, earthy, very fine;	1		
Limestone, brownky gray, lithographic	4 1		1	shale, calcareous, black, brown.	10		1485
shale, gray.	111		1118	Dolomite, argillaceous, laminated,	{ {		
Limestone, brown, lithographic, very	<u> </u>			buff, gray, green, very fine, earthy	3		
fine, metasorphosed.	8		1126	shale, green; scattered send.	50		1535
Limeatone, buff, very fine, fine,	1 1		ł	Dolomite, sandy, buff, brown, gray,	1 1		ł
partly conglomeratic.	34		1160	fine to very fine; sandstone, dolo-	1 .		
Limestone, partly argillaceous, brown				mitic, white, fine.	8		1543
gray, lithographic, fine, brown	1. 1			St. Poter Sandstone	]		1
partings.	5		1165	Sandstone, dolomitic, white, gray,	1 [		1
Limstone, buff, lithographic, to				fine; some argillaccous.	12		1555
fine; brown partings.	10		1175	Sandstone, delomitic, white, fine,	۱ ۱		1
Same, some gray, partly dolomitic.	10		1185	very fine.	15		1570
Limestone, dolomitic, brown, gray,				Sardstone, argillaceous, dolomitic,			
The Chie Oil Company	Shr	a, Lon	<u> </u>	The Ohio Oil Company	Sha	Tick	

S.S.#11355 county Douglas

s.s./11355 county Douglas

36-1611-8E

Page 5 ILLINOIS GEOLOGICAL SURVI	EY, URBANA			Page 6 ILLINOIS GEOLOGICAL SURVEY, UNBAR	IA	·	
Strata	Thickness	Top	Bottom	Strata	Tilckness	Тор	Bottom
quartzitic, gray; shale, doloni dark brown, netroliferous. Sandstore, dolonitic, white, fir	20		1590	Dolozita, slightly sandy, cherty, gravery fine to fine; shale, green. Dolomite, fine, sandy, white to buff	14		1981
nadium, pyritic; parobably shad and dolomite partings.	20		1610	fine, very fine; shale, green. Dolowite, sandy, grayish-buff, green	9		1990
Sandstone, white, fine to medium pyritic, in part. Same; shale, green; dolomite, by	75		1685	ish, very fine to fine; colitic chert.  Dolomite, buff, light gray, cherty,	10	 	2000
fine. Shakopee Dolomite	10		1695	fire; sandstone, dolomitic, gray, brown.	10		2010
Dolomite, cherty, white, very fi shale, green. Dolomite, cherty, grayish-buff,	: 10		1705	Dolomite, as above; colitic chert, white. Dolomite, cherty, gray, very fine;	10		2020
fine; sandstone, dolonitic, bushile, green.	ff; 9	1.0	1714	little sand. Same, dolomite, gray, medium; sand-	5		2025
Polomite, grayish-Buff, very fine Same, chert, colitic, white; che white; sandstone, siliccous, who modumed the same same same same same same same sam	ert,		1735	stone, dolomitic, gray. New Richmond Formation Sandstone, dolomitic, siliceous, white, medium; colitic chert; dolo-	l 11	,	2036
Polomite, cherty, buff, very fix sandstone, colomitic, white, fi shale, green.			1755	mite, as above. Oneota Dolomite Chert, dolomitic, oolitic, brown;	314	!	2070
Dolomite, as above; some colitic green shale; sand.	c chert; 20		1775	dolomite, brown, fine; sandstone as above.	15		2085
Dolomite, as above; sandstone, nitic, and siliceous; greenshal and shale, gray and green, at	le, 1810'.40		1815	Dolomite, brown, fine; chert, partly oolitic, white to brown; shale, greened and sandy	n,11		2096
Sandatone, siliceous, colomitic buff, medium; dolomite as abov Dolomite, buff, gray, very fine	e.   13		1828	Dolomite, very cherty, brown, fine to medium, sdattered sand.  Dolomite, sandy, light gray to buff,	20		2120
colitic chart; little sandston Chert, colitic, brown, green; d	0. 27		1855	fine, cherty. Dolomite, sandy, white, fine, medium			2133
as above.  Dolomite, sordstore and shale.  Wostly dolomite, some chert (sa and shale as above.			1860 1893	some chort. Same, more cherty, buff. Dolonite, chorty, buff, fine. Polonite, chorty, white, fine.	17 15 15		2150 2165 2180
Dolonite, white, very fine, sli cherty; neattered sand.	ghtly   72   12		1965	Doloute, cherty, white, fine; colition chart, white. Same, but gray, sandy.	10		2190 2200

The Chio Oil Company country Douglas S.S. #11355

Shaw, Lewis #1 36-161-8R

The Ohio Oll Company county Douglas S,S.#11355

Shaw, Lewis #1 36-162-88

ILLINOIS GEOLOGICAL SURVEY, URBANA

Tobloits, cherty, sundy, very light buff, fine, needium.  Delouite, slightly eandy, gray, fine sensor list buff, fine, needium.  Senso, very cherty, beloaite, cherty, gray, medium.  Delouite, cherty, sandy, gray, medium.  Delouite, white, oflit is part.  Delouite, cherty, gray, nedium, and gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, and gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, and gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, druny quarts, green quarts.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, nedium, sandy, gray, fine to medium.  Delouite, cherty, gray, sedium, sandy, gray, fine to medium.  Delouite, cherty, gray, sedium, sandy, gray, fine to medium.  Delouite, cherty, gray, sedium, sandy, gray, fine to medium.  Delouite, cherty, gray, gray, fine, sandy, gray, fine to medium, sandy, gray, fine to medium, sandy, gray, fine to medium, sandy, gray, fine to medium.  Delouite, cherty, gray, sedium, sandy, gray, fine to medium, sandy, gray, gray	h130	- ILLINO'S GEOLOGICAL SURVEY, GRBAN	**********			1210 C ILLINOIS GEOLOGICAE SURVET, DIBAN	<b>.</b>		
bufif, fine, necitium. Dolonite, slightly sandy, gray, fine Sene, very cherty. Dolonite, cherty, sandy, gray, modium. Dolonite, cherty, sandy, gray, modium. Dolonite, sandy, gray, modium. Dolonite, sandy, gray, modium. Dolonite, withe, first to madium, chert, white, collitic in part. Dolonite, cherty, wither to light gray, nedium. Dolonite, cherty, gray, medium. Dolonite, cherty, gray, fine, beneful fine to medium. Dolonite, cherty, gray, fine, beneful fine, fine, development fine,		Strate	Thickness	Тор	Bottom	Strata	Thickness	Top	Bottom
bufif, fine, necitium. Dolonite, slightly sandy, gray, fine Sene, very cherty. Dolonite, cherty, sandy, gray, modium. Dolonite, cherty, sandy, gray, modium. Dolonite, sandy, gray, modium. Dolonite, sandy, gray, modium. Dolonite, withe, first to madium, chert, white, collitic in part. Dolonite, cherty, wither to light gray, nedium. Dolonite, cherty, gray, medium. Dolonite, cherty, gray, fine, beneful fine to medium. Dolonite, cherty, gray, fine, beneful fine, fine, development fine,	<u> </u>	olomite, cherty, sandy, very light			:	oolites	20		2655
blonite, slightly energy, gray, fine 5 2220 chally there and cherty collions. 10 2665 2276 bolonite, cherty, andy, gray, medium. 21 2271 blonite, cherty, gray, medium. 2271 blonite, thite, collitic in part. 2271 blonite, thite, collitic in part. 2271 blonite, thire, collitic in part. 2271 blonite, there, white, collitic in part. 2271 blonite, there, gray, medium. 27 2272 blonite, cherty, gray, medium. 28 2272 blonite, cherty, gray, medium. 29 2273 blonite, cherty, gray, medium. 20 2760 blonite, cherty, gray, medium. 20 2475 blonite, cherty, gray, medium, 20 2475 blonite, cherty, gray, gray, then belonite, cherty, andy, gray chert, drusy quarta; scattered and. 20 2475 blonite, there, andy, gray fine, medium, candy, white, fine; ccattered cherty collities. 20 2522 blonite, fine to medium, andy, white, fine; ccattered cherty collities. 20 2525 blonite, fine to medium, and the part of the pa			12/4	'	2214		•		}
Same, very cherty. Delonite, cherty, sandy, gray, medium. Delonite, santy, gray, medium. Delonite, shite, fina to radium, sandy, gray, fine to medium, sandy, gray, perty arillaceous, gray, fine to medium, sandy, gray, fine, to medium, sandy quartz, self-structured cherty sandy, gray, fine, to medium, sandy, gray, gray, fine, to medium, sandy, gray, fine,			6		2220				2665
Delonite, cherty, sandy, gray, medium. 21 Delonite, sandy, gray, medium. 11 Delonite, white, fina to radium, chert, white, colitic in part. 12 Delonite, very cherty, white to light gray, medium. 17 Same, sone brown, e'crty colites. 17 Delonite, cherty, gray, medium, drusy quarts; green quarts. 17 Delonite, cherty, gray, medium, 5 Delonite, cherty, gray, medium, 5 Delonite, cherty, gray, medium, 6 Delonite, cher			16		2236		•		
boloatte, sandy, gray, medium, bloanite, white, finz to radium; chert, white, colitic in part.  boloatie, very chorty, white to light gray, andium.  boloatie, very chorty, gray, medium.  boloatie, cherty, gray, medium.  boloatie, cherty, gray, medium, drusy quarts, green quarts.  boloatie, cherty, gray, medium, drusy quarts, green quarts.  boloatie, cherty, gray, medium; colitic chert, boloatie, cherty, andy, gray, fine, medium, andy white, fine; castreed sand, boloatie, fine to medium, gray quarts.  boloatie, thite, fine; oolitic cherty cherty, drusy quarts castled sand, boloatie, fine to medium, andy white, fine; castreed cherty colities.  boloatie, cherty, brown, medium, andy, white, fine; castreed cherty colities.  boloatie, pray, brown, medium; much colitic chert, brown.  boloatie, pray, brown, medium; much colitic chert, brown, fine; much colitic cherty.  boloatie, pray, brown, medium; much colitic cherty, brown, fine; much colitic, cherty, brown, fine; candy, gray, fine, brown, fine; candy, gray, fine, brown, fine; candy, fine, candy, fine, candy, fine, candy, gray, fine, brown, fine; candy, fine, candy, fine, candy, fine, candy, fine, colitic, brown, fine, candy, fine, colitic, brown, fine, candy, fine, candy, fine, candy, fine, candy, fine, candy, fine, candy, fine, colitic, brown, fine, candy, fine, candy, fine, candy, fine, candy, fine, candy, fine, candy, fine,			.24		2260		15		2680
bolonite, white, firs to readium, chert, white, oclitic in part.  blocatite, very cherty, white to light gray, nedium.  bloom te, cherty, gray, medium.  bloom te, cherty, gray, medium, drusy quarts, green quarts.  bloomite, cherty, gray, medium, oclitic chert, drusy quarts, scattered sand.  bloomite, cherty, sandy, gray; chert, drusy quarts, scattered sand.  bloomite, cherty, sandy, gray; chert, drusy quarts, scattered sand.  bloomite, cherty, sandy, gray, fine, sandy, gray, fine to medium.  bloomite, cherty, sandy, gray; chert, drusy quarts, scattered sand.  bloomite, cherty, sandy, gray, fine, sandy, gray, fine to medium, shiften to medium, and, white, fine; scattered cherty colities.  bloomite, cherty, sandy, gray, fine, sandy, gray, fine to medium, shiften to									
chert, white, colitic in part.  Dolonite, very cherty, white to light gray, medium.  Dolonite, cherty, gray, medium.  Dolonite, cherty, gray, medium, drusy quarts, green quarts.  Dolonite, cherty, gray, medium, colitic cherty, gray, medium;  colitic cherty, gray, medium;  colitic cherty, andy, gray; chert, drusy quarts; cattered sand.  Dolonite, cherty, sandy, gray; chert, drusy quarts; colitic cherty, and guarts; colitic chert, drusy quarts; colitic, drusy quarts; colonite, dru			} }				4		2685
Dolonite, very cherty, white to light gray, nodium.  Same, sone brown, charty collides.  17			144		2315				
Bolon'te, cherty, gray, medium.  Same, some brown, electy colities.  Dolonite, cherty, gray, nedium, drusy quarts, green quarts.  Dolonite, cherty, gray medium, solitic chert, gray medium, colitic, cherty, gray medium, solitic chert, gray medium, collonite, cherty, gray, fine, to medium, gray, fine, to medium, gray, fine, to medium, gray, medium, collonite, white, fine; dray duarts.  Dolonite, cherty, gray, fine, to medium, gray, fine, to medium, gray, medium, gray, fine, to medium, gray, modium, collitic cherty  Dolonite, white, fine; dollite, modium.  10 2595  Same, and sand, fine to medium.  20 2615  Same, and sand, fine to medium.  210 2615  Same, and sand, fine to medium.  220 2615  Same, some sandy, gray, fine, to medium.  2212 2621  Same, with brown shale partings.  Same, with brown shale partings.  Same, with brown, gray, fine, to medium.  2222  Dolonite, slightly glauconitic, collitic, modium.  2232  Dolonite, slightly glauconitic, brown to gray, fine to medium.  23020  Same, with brown shale partings.  Same, with brown shale partings.  Same, with brown shale partings.  Same, with brown, gray, fine, to medium.  23057  Same, with brown, fine, sandy, gray, fine, to medium.  24158  Same, with brown, fine, sandy, gray, fine, to medium.  25015  Same, with brown, fine, sandy, gray, fine, to medium.  25026  Same, with brown, fine, sandy, fine, to medium, to gray, fine, to medium, t		• •		•		•	10		2695
Dolorite, chorty, gray, medium.  Dolorite, chorty, gray, medium, drusy quartz, green quarts.  Dolorite, cherty, gray, nedium, drusy quarts, green quarts.  Dolorite, cherty, gray, medium, drusy quarts, green quarts.  Dolorite, cherty, gray, medium, drusy quarts, gray, medium, drusy quarts, gray, medium, drusy quarts, gray medium, drusy quarts, gray, medium, drusy quarts, gray quarts, gray, fine, brown, gray, medium, drusy quarts, gray there, drusy quarts, scattered sand.  Dolorite, cherty, sandy, gray, fine, gray, fine, gray quarts, gray there, gray quarts, gray to brown, gray, medium, gray, gray, fine, gray, medium, gray, medium, gray, medium, gray, gray, fine, gray, medium, gray				ı	21/08				//
Same, some brown, c'esty colitics.  Dolomite, cherty, gray, medium, drusy quartz, green quartz.  Dolomite, cherty, gray, medium.  Dolomite, cherty, gray, medium.  Dolomite, cherty, gray, medium.  Dolomite, cherty, gray, medium.  Dolomite, cherty, gray, medium; colitic chert.  Dolomite, cherty, gray, medium; colitic chert, gray, medium; colitic chert, gray, medium; colitic chert, gray, medium; colitic cherty, gray, fine, gray, gr	g l	olomite, cherty, gray, medium,					]	•	٠
bolomite, cherty, gray, medium, drusy quartz. green quarts.   8   2450   2450   2500   2760			1 ' 1				ואל	1	2710
quartz, green quarts.  Dolomite, cherty, gray, medium.  Dolomite, cherty, gray igh-brown, medium.  Dolomite, cherty, gray medium; oolitic chert.  Dolomite, cherty, gray, medium; oolitic chert.  Dolomite, cherty, gray, medium; oolitic chert.  Dolomite, cherty, gray, medium; oolitic, cherty, gray, medium; oolitic, cherty, gray, medium; oolitic, cherty, gray, medium; oolitic, cherty, gray, gray, chert, drusy quartz, gray tert.  Dolomite, cherty, sandy, gray; chert, drusy quartz, gray to brown, fine, solitic cherty, drusy quartz, gray to brown, gray, fine to medium.  Dolomite, cherty, sandy, gray, fine, gla uconitic flecks.  Dolomite, slightly glauconitic, medium.  Dolomite, slightly glauconitic, medium, Dolomite, white, fine to medium.  Dolomite, slightly glauconitic, medium.  Dolomite, white, fine to medium.  Dolomite, slightly glauconitic, medium.  Dolomite, white, fine to medium.  Dolomite, slightly glauconitic, medium.  Dolomite, slightly glauconitic, medium.  Dolomite, slightly glauconitic, motiled, brown, gray, medium, oolitic (?).  Same, and, slightly glauconitic, medium.  Dolomite, slightly glauconitic, medium.  Dolomite, slightly glauconitic, medium.  Dolomite, slightly glauconitic, motiled, brown, gray, medium, oolitic (?).  Same, sandy, all glauconitic, Dolomite, sandy, glauconitic, motiled, brown, gray, fine, oolitic, motiled, brown, gray, fine, oolitic, motiled, brown, fine, scattered very fine glauconite.  Dolomite, slightly glauconitic, motiled, prown, fine, medium.  Dolomite, slightly glauconitic, motiled, prown, fine, oolitic, (?).  Same, and white.  Dolomite, slightly glauconitic, motiled, prown, fine, medium.  Dolomite, slightly glauconitic, motiled, prown, fine, medium.  Dolomite, slightly glauconitic, motiled, prown, fine, oolitic, (?).  Same, and white.  Dolomite, slightly glauconitic, motiled, prown, fine, medium.  Dolomite, slightly glauconitic, motiled, prown, fine, medium.  Dolomite, slightly glauconitic, motiled, prown, fine, oolitic, (?).  Same, and white.  Dolomite, slightly glauconiti					~~~~				
Dolomite, cherty, gray, medium.  Dolomite, cherty, grayish-brown, medium.  Dolomite, cherty, gray, medium;  oolitic chert.  Dolomite, cherty, gray, medium;  oolitic chert,  drusy quartz.  Dolomite, brown, medium, drusy quartz,  glauconitic flecks.  Dolomite, slightly glauconitic,  mottled, gray to brown, fine to  medium.  Dolomite, white, fine; oolitic chert;  drusy quartz.  Dolomite, white, fine to medium, gandy, white,  fine; scattered cherty oolites.  Dolomite, grayillaceous, gray to brown,  fine, nedium; oolitic cherty.  Dolomite, prown, fine; much oolitic chert,  Dolomite, prown, fine; much oolitic chert,  Dolomite, prown, fine; much oolitic chert,  Dolomite, sandy, glauconitic, brown  to gray, fire to medium.  Same, with brown shale partings.  Dolomite, slightly glauconitic,  Dolomite, slightly glauconitic,  Same, with brown shale partings.  Dolomite, slightly glauconitic,  Same, with brown shale partings.  Dolomite, slightly glauconitic,  Same, with brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  Shay, Loville laborate.					21,50	Dolonita brown grove fine to moditive			
Delomite, cherty, grayish-brown, medium; colitic chert.  Dolomite, cherty, sandy, gray; chert, drusy quarty, sandy, gray; chert, drusy quarty seattered sand.  Dolomite, cherty, sandy, gray; chert, drusy quarty, sandy, gray; chert, drusy quarts; cattered sand.  Dolomite, cherty, sandy, gray; fine, medium.  Dolomite, cherty, sandy, gray, fine, medium.  Dolomite, cherty, sandy, gray, fine, medium.  Dolomite, white, fina; colitic chert; drusy quarts.  Dolomite, ina to medium, andy, white, fina; cattered cherty colities.  Dolomite, gray; brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic cherty.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaccous, brownish-gray; free cand; sandatone, argillaccous, gray to brown, fine, sandy, gla uconitic, brown, fine to medium.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, fine; colitic, fine; candy, gray; fine to medium.  Dolomite, fine; colitic, fine; candy, gray; fine to medium.  Dolomite, fine; candy fine, candy, fine to medium.  Dolomite, fine; fine; candy, gray; fine to medium.  Dolomite, fine; f			, ,			DOTORITOS DEONIS GRAS TIMO CO MOCE UM	1.0		2815
medium.  Dolomite, cherty, gray, medium; colitic chert.  Dolomite, cherty, sandy, gray; chert, drusy quarts; scattered sand.  Dolomite, cherty, sandy, gray; fine, medium.  Dolomite, cherty, sandy, gray; chert, drusy quarts; scattered sand.  Dolomite, cherty, sandy, gray; fine, medium.  Dolomite, white, fine; colitic chert; drusy quarts.  Dolomite, white, fine; colitic chert; drusy quarts.  Dolomite, fine to medium, sandy, white, fine; scattered cherty colites.  Dolomite, argillaceous, gray to brown, fine; medium; oolitic cherty.  Dolomite, gray, brown, medium; much colitic, chert, brown.  Sane and sand, fine to medium.  Sane, and white.  Dolomite, brown, fine to medium.  Sane, and white.  Dolomite, brown, fine to medium.  Sane, and white.  Dolomite, brown, fine, scattered very fine glauconite.  Dolomite, to resulting partered chert  The Ohio Oil Company  Shaw, Louis #1					, ,,,,,			į.	
Dolomite, cherty, gray, medium; oolitic chert. Dolomite, cherty, andy, gray; chert, drusy quarta; scattered sand. Dolomite, cherty, sandy, gray, fine, medium. Dolomite, white, fina; oolitic chert; drusy quartz. Dolomite, white, fina; oolitic chert; drusy quartz. Dolomite, white, fina; oolitic chert; drusy quartz. Dolomite, fina to medium, sandy, white, fina; scattered cherty oolites. Dolomite, argillaceous, gray to brown, fina; nedium; oolitic cherty Dolomite, gray, brown, medium; much oolitic chert. Dolomite, gray, brown, medium; much oolitic chert. Dolomite, pray, brown, fina; much oolitic chert, brown. Same and sand, fina to medium. Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fina; oolitie. Dolomite, fina to vory fine, candy, green, fina; oolitie. Dolomite, thrown, fine, sandy, gray, fine, to medium. Dolomite, brown, fine, scattered chert  Dolomite, brown, fine, scattered chert  The Onto Oil Congenty  The Onto Oil Congenty  Arusy quartz. Dolomite, flicks, brown, fine to medium, drusy quartz. Dolomite, flicks, brown, fine to medium, drusy quartz. Dolomite, flicks, slightly glauconitic, mottled, gray to brown, gray, medium, looplate, sandy, glauconitic, brown to gray, fine to medium. looplate, sandy, glauconitic, brown to gray, fine to medium. looplate, stightly glauconitic, same, with brown shale partings. Dolomite, slightly glauconitic, looplate, brown, fine, oolitic, oolitic, mottled, brown, gray, fine, looplate, brown, fine, to medium. looplate, brown, fine, brown, gray, fine, looplate, brown, fine, brown, fine, looplate, brown, fine, brown, gray, fine, looplate, brown, fine, bro			20		21,75		) Ju	1	2009
colitic chert.  Dolomite, cherty, andy, gray; chert, drusy quartz; scattered sand.  Dolomite, cherty, sandy, gray, fine, medium.  Dolomite, cherty, sandy, gray, fine, medium.  Dolomite, white, fine; colitic chert; drusy quartz.  Dolomite, fine to medium, andly, white, fine; scattered cherty colities.  Dolomite, rine to medium, andly, white, fine; scattered cherty colitic chert, brown, fine; much colitic chert.  Dolomite, gray, brown, medium; much colitic chert, brown.  Dolomite, prown, fine; much colitic chert, brown.  Dolomite, argillaceous, pray to brown, fine; much colitic chert.  Dolomite, pray, brown, medium, much colitic chert, brown.  Dolomite, pray, brown, fine; much colitic chert, brown.  Dolomite, argillaceous, brownish-gray; free cand; sandatone, millaceous, green, fine; colitic.  Dolomite, argillaceous, brownish-gray; free cand; sandatone, millaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, green, fine; colitic.  Dolomite, brown, fine; candy, green, fine; colitic.  Dolomite, brown, fine; candy, green, fine; colitic.  Dolomite, brown, fine; candy, green, fine; candy, green, fine; colitic.  Dolomite, brown, fine, candy, green, fine; candy, green, green, fine; candy, green, fine; candy, green, fine; candy, green,			20		2417		30	1	2875
Delomite, cherty, andy, gray; chert, drusy quartz; scattered sand.  Dolomite, cherty, sandy, gray, fine, nedium.  Dolomite, white, fina; collitic chert; drusy quartz.  Dolomite, fina to medium, andy, white, fina; scattered cherty collites.  Dolomite, argillaceous, gray to brown, fine; much collitic chert.  Dolomite, brown, fine; much collitic chert, brown.  Same and sand, fine to medium.  Dolomite, pray, brown, medium.  Dolomite, brown, fine; much collitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, gray to brown and sand; fine to medium.  Dolomite, brown, fine; much collitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; collitic.  Dolomite, fino to very fine, candy, green, fine; olitic.  Dolomite, brown, fine; much collitic.  Dolomite, brown, fine; much collitic.  Same, some sandy, all glauconitic, brown to gray, fine to medium.  Dolomite, brown, fine; much collitic chert, brown.  Same, with brown shale partings.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shau, Lovid #1			6		2),87		_		4012
drusy quartz; scattered sand.  Dolomite, cherty, sandy, gray, fine, nedium.  Dolomite, white, fine; colitic chert; drusy quartz.  Dolomite, fine to medium, sandy, white, fine; scattered cherty colites.  Dolomite, argillaceous, gray to brown, fine, solitic cherty  Dolomite, gray, brown, medium; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, gray fine, chert, fine onto 0il Company  The Onio 0il Company  Dolomite, satisfatly glauconitic, mottled, gray to brown, fine to medium.  Dolomite, slightly glauconitic, motium.  Dolomite, white, tinged brown, green, some sandy, all glauconitic, motiled, brown, gray, medium, solitic (?).  Same, some sandy, all glauconitic, brown to gray, fine to medium.  Dolomite, slightly glauconitic, ocolitic, mottled, brown, gray, medium, solitic (?).  Same, some sandy, all glauconitic, brown to gray, fine to medium.  Same, with brown shale partings. Dolomite, slightly glauconitic, colitic, mottled, brown, gray, medium, solitic (?).  Same, with brown shale partings. Dolomite, slightly glauconitic, ocolitic, mottled, brown, gray, medium, solitic (?).  Same, with brown shale partings. Dolomite, slightly glauconitic, solitic, solitic, brown, fine, scattered very fine.  Dolomite, sightly glauconitic, modium.  15  3020  Same, with brown shale partings. Dolomite, slightly glauconitic, ocolitic, mottled, brown, gray, medium, solitic, solitic, solitic, brown, fine, scattered very fine.  Dolomite, sightly glauconitic, modium.  15  Same, with brown shale partings. Dolomite, slightly glauconitic, brown to gray, fine, scattered very fine.  Dolomite, sightly glauconitic, modium.  15  Same, some sandy, all glauconitic.  Same, some sandy, all glauconitic.  Dolomite, sightly glauconitic.  Same, some sandy, all glauconitic.  Dolomite, sightly glauconitic.  Same, some sandy, all glauconitic.  Dolomite, sightly glauconitic.  Same, some sandy san	,						80		2055
Dolomite, cherty, sandy, gray, fine, nedium.  Dolomite, white, fine; colitic chert; drusy quartz.  Dolomite, fine to medium, sandy, white, fine; scattered cherty colitics.  Dolomite, argillaceous, gray to brown, fine; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, gray to brown if needium.  Same and sand; sandstone, argillaceous, gray; fine candy, green, fine; colitic.  Dolomite, fine to wory fine, candy, gray; fine to modium.  Dolomite, brown, fine to modium.  Same, with brown shale partings.  Dolomite, brown, gray, fine, very fine.  Dolomite, brown, fine to medium.  Same, with brown shale partings.  Dolomite, slightly glauconitic, colitic, motitled, brown, gray, fine, very fine.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shay, Lowley fine  The Ohio Oil Company  Shay, Lowley fine  The Ohio Oil Company  Shay, Lowley fine  Shay, Lowley fine  The Ohio Oil Company  Shay, Lowley fine  The Ohio Oil Company  Shay, Lowley fine  Shay, Lowley fin					21,05		1 80		4777
Delomite, white, fine; colitic chert; drusy quartz.  Delomite, fine to medium, sandy, white, fine; scattered cherty collites.  Delomite, argillaceous, gray to brown, fine, medium; chert, brown, fine; much collitic chert.  Delomite, brown, fine; much collitic chert, brown.  Same and sand, fine to medium.  Delomite, argillaceous, gray to brown, fine; much collitic chert.  Delomite, brown, fine; much collitic chert, brown.  Same and sand, fine to medium.  Delomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; collitic.  Delomite, fine to very fine, candy, green, fine to medium.  Delomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowling fine for the first production of the fine fine fine for the fine fine fine fine fine fine fine fin	1 -		+4		(4/)		(	:	
Dolomite, white, fine; colitic chert, drusy quartz.  Dolomite, fine to medium, sandy, white, fine; scattered cherty colites.  Dolomite, argillaceous, gray to brown, fine, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish—gray; free sand; sandstone, graillaceous, gray; fine to medium.  Dolomite, argillaceous, brownish—gray; free sand; sandstone, graillaceous, green, fine; colitic, fine to very fine, sandy, and white.  Dolomite, brown, fine to medium.  Dolomite, brown, fine to medium.  Dolomite, slightly glauconitic, modium.  Dolomite, sandy, all glauconitic, brown to gray, fine to medium.  Dolomite, slightly glauconitic, modium.  Dolomite, mottled, brown, gray, fine, solomite, modium.  Dolomite, mottled, brown, gray, medium, solomite, modium.  Dolomite, sightly glauconitic, modium.  Dolomite, sandy, glauconitic, modium.  Dolomite, mottled, brown, gray, medium, solomite, modium.  Dolomite, sandy, glauconitic, modium.  Dolomite, sandy, glauconit			177		2512		ا مد ا		2000
drusy quartz.  Dolomite, fine to medium, sandy, white, fine; scattered cherty colites.  Dolomite, argillaceous, gray to brown, fine, nedium; colitic cherty  Dolomite, gray, brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Same and sand; fine to medium.  Dolomite, argillaceous, gray to brown, medium; much colitic, chert, brown.  Same and sand, fine to medium.  Same and sand; fine to medium.  Same and sand; sandstone, grayllaceous, green, fine; colitic.  Dolomite, argillaceous, grayllaceous, green, fine; colitic.  Dolomite, brown, fine; colitic.  Dolomite, fine to redium; peattered chert  The Onio Oil Company  Chay, Lowis #1  The Onio Oil Company  Sandy, with brown shale partings.  Dolomite, slightly galuconitic, motiled, brown, gray, fine, colitic, motiled, brown, fine, scattered very fine.  Dolomite, fine to redium; peattered chert  The Onio Oil Company  Shaw, Lowis #1					عدرع		1	:	2770
Dolomite, fine to medium, sandy, white, fine; scattered cherty colites.  Colomite, argillaceous, gray to brown, fine, nedium; colitic cherty  Dolomite, gray, brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to podium; peattered cherit  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1	1				2522				2000
fine; scattered cherty colites.  Bolomite, argillaceous, gray to brown, fine, medium; colitic cherty  Dolomite, gray, brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish—gray; free cand; sandstone, argillaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, gray, fine, candy, gray, fine to medium.  Dolomite, fine to colitic.  Dolomite, fine to very fine, candy, gray, fine, candy, gray, fine, brown, fine, scattered very fine gray, fine to profix; peattered chert  The Chio Cil Company  Shaw, Lowis #1  The Chio Cil Company  Shaw, Lowis #1	3		1	•	2266		1		المماد
Colomite, argillaceous, gray to brown, fine, nedium; colitic cherty  Dolomite, gray, brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, gray, fine, candy, gray, fine to medium.  Dolomite, brown, fine to medium.  Same, with brown shale partings.  Dolomite, slightly glauconitic, colitic, mottled, brown, gray, fine, very fine.  Dolomite, brown, fine to medium.  Dolomite, brown, fine to medium.  Same, am white.  Dolomite, brown, fine to medium.  Same, am white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1			S,a		2570		m,		2000
fine, medium; colitic cherty  Dolomite, gray, brown, medium; much colitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, mray, fine to medium; peattered chert  The Ohio Oil Company  Dolomite, sandy, glauconitic, brown to gray, fine to medium.  15 3035  Same, with brown shale partings. 18 3053  Dolomite, slightly glauconitic, colitic, mottled, brown, gray, fine, very fine.  Dolomite, brown, fine to medium. 13 3070 Same, and white. Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1					2210		0		
Dolomite, gray, brown, medium; much oolitic chert.  Dolomite, brown, fine; much oolitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free cand; sandstone, argillaceous, green, fine; oolitic.  Dolomite, fine to very fine, candy, gray, fine to medium.  Dolomite, fine to very fine, candy, gray, fine to medium.  The Ohio Oil Company  The Ohio Oil Company  Same, with brown shale partings.  Same, with brown shale partings.  Same, with brown shale partings.  Same, with brown, fine, scattered medium.  Same, and white.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1			12	,	שלאל ה		12		3020
oolitic chert.  Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, ergillaceous, proventiate.  Dolomite, fine to very fine, sandy, pray, fine to medium.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1			12	1	2203		ا ر ا		2000
Dolomite, brown, fine; much colitic chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, grayillaceous, green, fine; colitic.  Dolomite, fine to very fine, candy, fine to medium.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1			1,0		2505			1	
chert, brown.  Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, ergillaceous, green, fine; colitic.  Dolomite, fine to very fine, sandy,  pray, fine to medium.  The Ohio Oil Company  Chay, Lewis #1  Chay, Lewis #1  Chay, Lewis #1			TO		4272		ן אַן		3053
Same and sand, fine to medium.  Dolomite, argillaceous, brownish-gray; free sand; sandstone, ægillaceous, green, fine; colitic.  Dolomite, fine to very fine, sandy, free fine to medium.  2624  Very fine.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1					0634				}
Dolomite, argillaceous, brownish-gray; free sand; sandstone, argillaceous, green, fine; solitic.  Dolomite, brown, fine to medium.  Same, and white.  Dolomite, brown, fine, scattered very fine glauconite.  The Ohio Oil Company  Shaw, Lowis #1							1		
free sand; sandstone, argillaceous, green, fine; colitic.  Dolomite, fine to very fine, sandy, gray, fine to redire; posttered chest  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1					5051	very fine.			
Polomite, fine to work fine, candy,  The Chio Cil Company  Tree cand; sandstone, Englifaceous, green, fine; solitic.    Dolomite, brown, fine, scattered very fine glauconite.   105   3080     Dolomite, brown, fine, scattered very fine glauconite.   105   3185     The Chio Cil Company   Chay, Levils #1					1	Dolomite, brown, fine to medium.	~/		
Polomite, fine to very fine, sandy,  frag, fine to madim; posttered chest  The Ohio Oil Company  Shaw, Lowis #1  The Ohio Oil Company  Shaw, Lowis #1					1000	Same, and white.	1	j	3090
The Ohio Oil Company Shaw, Lowis #1 The Ohio Oil Company Shaw, Lowis #1			1 17		2035		1	i	
The Ohio Oil Company Shaw, Lowis #1 The Ohio Oil Company Shaw, Lowis #1	1:		1.		<b>[</b>	fina glauconite.	105		3185
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COUNTY TIQUETAR S.S.#11355 30-1011-015   COUNTY Douglas S.S.#11355 30-1011-015			Shar	i, Low	I ff↓		<b>S</b> )		
	COIN	TV Douglan 9.5.#11355		-\!\01-0:\	OK	COUNTY Douglas S.S. #11355		30 -101	OR

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Page y ILLINOIS GEOLOGICAL SURVEY, URBANA	\ -			Page ILLINOIS GEOLOGICAL SURVEY, URBAN	۸ 		
Strata	Thickness	Тор	Bottons	Strate	Thickness	Тор	Bottorn
Seme, partly colitic; nome shale streaks.	30		3215	white, fine, very fine, sandy. Limestone, dolomitic, colitic, buff, fine, granular, porous, very finely	22		3450
Dolonite, slightly galuconitic, buff, fine. Franconia-Formation	10		3225	sandy. Limestone, delomitic, colitic, brown,	15		31,65
Polomite, silty, sandy, fine, glau-			}	buff, white, fine to very fine, sand	y.95	[	3560
conitic, gray, green, very fine, fin	3.15		3240	Siltstone, glauconitic, micaceous,	1.		. 6
Samo, little pink.	10		3250	green, pink; colitic limestone, as	1 1	• 1	
Same; shale, green, firm.	5		3255	above.	30		3590
Sandstone, dolomitic, glauconitic,	ľ			Siltatone; shale, micaceous, red,	120		2/22
gray, green, fine, nedium. Galesville sandstone	10		3265	pink, brown, very tough. Siltstone, micaceous, pink; colitic	10	[	3600
Sandstone, dolonitic, slightly	. 1			limestone.	10	٠. ا	3610
galuconitic, white, fine.	20		3285	Siltstone, micaceous, pink, green.	25	·	3635
Eau Claire Formation	•			Siltstone, micaceous, pink; scattered colites.			260
Dolomite, sandy, partly argillaceous,				Siltstone, micaceous, pink, little	15	i	3650
gray to dark gray.	5		3290	green; scattered red shale and	]	. ]	
Dolomite, argillaceous, partly	1	•		colitic limestone.	80		2720
glauconitic, dark brown, dark gray,	ا م			Shale, rad; siltatone, pink; colitic,		l	3730
sandy at top.	45	÷	3335	limestone; siltstone, green.	15	[	3715
Sandstone, dolomitic, gray, brown,	ا بر		2200	Siltstone, micaceous, pink; shale, re			3762
fire to medium.	15		3350	Same, and colitic, pink and brown	1	1	2102
Dolomite, very sandy, dark brown,	ا ب		2200	dolomite; siltstone, green.	12	ļ	3774
gray, fine to medium.	15		3365	Siltstone, pink, green; shale, red;		. 1	2114
Dolomite, argillaceous, brown, fine,	اما		2220	dolomite, pink,	lu l	]	3785
shale, slightly glauconitic, green.	.5		3370	Siltstone, pink, shale, red, little		j	2102
Dolomite, as above, but glauconitic; shale, gray, green, brown.	20		2200	green.	27	l	3812
Shale, dolomitic, brown; dolomite,	20		3390	Shale, red, green, glauconitic; silt-	1 . 1	j	30-4
as above.	5		3395	Aline, pink, gray.	58	j	3870
Limestone, dolomitic, silty, buff,	7		כלככ	Shale, siltstone, buff, brown, reddis		ì	, , , ,
medium to coargo, glauconitic;	-			dolomitic,	35	1	3905
siltstone, gray.	4		31:00	Shale, sandy, micacoous, green.	5		3910
Shale, green, firm; scattered dolomit	2.12		31412	Same; dolomite, glauconitic; shale,	1. 1	ł	
Same; limestone, colitic, brown, gray			1	gray, brown, sandy, micaceous.	10		3920
fine, cal careous.	8		31,20	Shale, green, sandy, micacoous, part	1 1	ĺ	_
No samplo	8		31,28	glanconitic.	20	1	3940
Limestone, dolomitic, collitic, brown				Shale, green and red, mbcaceous.	20		3960
The Oile Oil Comment	C'a a	7	10 17	The Ohio Oil Company	Shar	vi. Loui	0 //1

The Ohio Oil Company count Douglas S.S.#11355

Shaw, Louis #1 36-1611-88 The Ohio Oil Company county Douglas S.S./11355

Shaw, Levils #1 36-16:-8B

Page 11	ILLINOIS GEOLOGICAL SURVEY, URBAN	A		
	Strata	Thickness	Top	Bottom
Dolomite	white, very finely crystall	-		
	ile, dark grayk green, dark			}
red, mid	• • • • • •	10		3970
	ark green and dark red,			
nicaceou	-	2		3972
	siltstone, dolomitic, gray,			,
glauconi		13		3985
	stly shale.	20		1,005
	ark gray and red.	5	ĺ	4010
	ark gray and red, silty;		٠.	
	e, pink, glauconitic.	10		4020
	lomite, silty to sandy,	-0		1 4020
	tic, gray; siltstone,	10		4030
Cap	ord, graff mrandoncy	10		4040
Shale		5	·	4045
	Formation			1 4045
· · • =	e, pyritic, quartzlitic, fine			
	en, micaceous.	lı	-	4046
	e, very fine, quartzitic.	l ii		4057
	very fine to modium,			1,400
	compact.	7		4064
	e, pink, very fine to coarse,			4004
	artzitic.	6		4070
sup ving	e, white, fire, incoherent.	26		4076
Sandatone	o, white, finto coarse,	20		4030
incohere	•	9		4205
	e, white, very fine to medium			4105
		35		मग्रिक ।
incohere		ן ככן		4140
	, white, fine to coarse,	5		4145
incohere				4145
torar del	oth, driller's log	]		]
District 1	annie Am	į i		165
Pluiged 1		Tanasa	10	1 1
	abandoned. Plugged to 165'	panua	cy lu,	1945.
	sater well at 165!	}	ł	
				1 1
"O OUTIT	ing time log kept.			ļ i
		[		
1:12 0:	lo Oil Company	Sha	u, Leni.	3 //1

The Onlo Oil Company county Douglas S.S.

S.S.//11355

Sham, Lemia #1 36-1611-8E

Request No. 2186 Project No.  Analysis requested by W. F. Mcents  Section. 26  111. Power Co. and sen  Collected by W. F. Mcents  Company Ill. Power Co.  Formation Pand - St. Peter  Producing zone depth 1594-1734  Casing: 5 1/2 inch to 1594  Perforation: No. of shots  S. Acid: Gellons from  from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained  Place where sample was obtained  Primary selinity  Secondary salinity	Date 4-12-62 Pool Tuescle Gas 3 orag L Sur. elev  Depth well drilled 1744 94 fort. from to Date to Date Barrels water  Prab Sample	County Dring in Lodez No.
mple of Brine Section 26  Ill. Power Co. and sen silected by H. F. Mernie mpany Ill. Power Co.  The Waltrip No.  Pormation 3211 - St. Peter Producing sone depth 1534-1734 Casing: 5 1/2 inch to 150 Perforation: No. of shots  Acid: Gellons from from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained. Date of completion of well Properties of reaction in percent:  Primary salinity r SO, in (r SO, + r Cl) Constituents  Ppm.	REPORT OF BRINE ANALYSIS  1038'S - 45'E-NW Curner  Prom	Present depth 1744  SO <sub>4</sub> ::::::::::::::::::::::::::::::::::::
mple of Brine Section 26  Ill. Power Co. and sen Hected by W. F. Mernie mpany Ill. Power Co.  rm W. H. Waltrip No.  Pormation Sand - St. Peter Producing some depth 1594-1734 Casing: 5 1/2 inch to 159 Perforation: No. of shots  Acid: Gallons from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained. So Date of completion of well Properties of reaction in percent:  Primary salinity r SO, in (r SO, + r Cl)  Constituents  Ppm.	1038'S - 45'E-NW Corner  Prom	Present depth 1744  SO <sub>i</sub> :
Section 26  Section 26  III. Power Co. and sen lieuted by W. F. Ments  mpany III. Power Co.  m W. H. Waltrip No.  Pormation Pani - St. Peter  Producing sone depth 1574-1734  Casing: 5 1/2 inch to 157  Perforation: No. of shots  Acid: Gallons from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained Date of completion of well  Properties of reaction in percent:  Primary salinity  r SO, in (r SO, + r Cl)  Constituents  Ppm.	Prom 16N Range BE  It to Date 4-12-62  Pool Tueccle Gas 3 orag  L Sur. elev  Depth well drilled 1744  94 foet.  from to Date  to Date  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	Present depth 1744  SO <sub>1</sub> : :::::::::::::::::::::::::::::::::::
Section  111. Power Co. and sen  lected by Wa Fa Mentis Inpany  Illa Power Co. Inpany  Illa Power Co. Inpany  Illa Power Co. Inpany  Formation  Portation  Production Sand - St. Peter  Producing sone depth 1594-1734  Casing: 5 1/2 inch to 159  Perforation: No. of shots  Acid: Gallons  from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained  Date of completion of well  Properties of reaction in percent:  Primary selinity  Secondary salinity  r SO. in (r SO. + r Cl)  Constituents  Ppm.	Prom 16N Range BE  It to Date 4-12-62  Pool Tueccle Gas 3 orag  L Sur. elev  Depth well drilled 1744  94 foet.  from to Date  to Date  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	Present depth 1744  SO <sub>1</sub> : :::::::::::::::::::::::::::::::::::
Section  111. Power Co. and sen  lected by / H. F. Ments  Inpany	Twp 16N Range BE  It to  Date 4-12-62  Pool Tuescle Gas 3 orag  L Sur. elev  Depth well drilled 1744  94 foet.  from to Date  to Date  Barrels water  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  (r COs + r HCOs) x  12. Reacting values  Ppm. %	Present depth 1744  SO <sub>1</sub> : :::::::::::::::::::::::::::::::::::
III. Power Co. and send send send send send by Wa Fa Mernis III. Power Co.  Pormation Pand - St. Peter  Producing sone depth 1594-1734  Casing: 5 1/2 inch to 159  Perforation: No. of shots.  Acid: Gallons from  Initial production: Barrels oil.  Present production: Barrels oil.  Place where sample was obtained.  Date of completion of well.  Properties of reaction in percent:  Primary selinity  Secondary selinity  r SO. in (r SO. + r Cl)  Constituents  Ppm.	Date 4-12-62  Pool Tuescle Gas 3 orag  L Sur. elev  Depth well drilled 1744  94 foet.  from to Date  to Date  Barrels water  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	SO <sub>4</sub> : :
lected by W. F. Meente Inpany Ill. Power Co. In W. H. Waltrip No.  Pormation Sand - St. Peter Producing some depth 1594-1734 Casing: 5 1/2 inch to 159 Perforation: No. of shots  Acid: Gellons from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained Date of completion of well Properties of reaction in percent:  Primary selinity Secondary salinity r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	Date 4-12-62 Pool Tuescle Ges 3 orag  L Sur. elev  Depth well drilled 1744  94 foet. from to Date to Date Barrels water Barrels water Barrels water Primary alkalinity Secondary alkalinity (r COs + r HCOs) x  12. Reacting values  Ppm. %	SO <sub>4</sub> : :
Pormation Pand - St. Peter Producing sone depth 1594-1734 Casing: 5 1/2 inch to 159 Perforation: No. of shots  Acid: Gallons from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained Date of completion of well Properties of reaction in percent:  Primary selinity r SO, in (r SO, + r Cl) Constituents  Ppm.	Pool Tueccia Gas 3 oraș  Sur. elev.  Depth well drilled 1744  94 fort.  from to Data  to Data  to Data  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	SO <sub>4</sub> : :
Pormation Pand - St. Peter Producing zone depth 1594-1734 Casing: 5 1/2 inch to 159 Perforation: No. of shots  Acid: Gallons from from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained Date of completion of well Properties of reaction in percent:  Primary salinity r SO <sub>6</sub> in (r SO <sub>6</sub> + r Cl) Constituents  Ppm.	Depth well drilled 1744  Q4 foet. from to Date to Date to Date Barrels water Barrels water Primary alkalinity (r COs + r HCOs) x  12. Reacting values Ppm. %	SO <sub>4</sub> : :
Producing sone depth 1594-1734  Casing: 5 1/2 inch to 159  Perforation: No. of shots  Acid: Gallons from from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained. Date of completion of well  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	94 fort. from to from to Date to Date Barrels water Barrels water Primary alkalinity Secondary alkalinity (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x	SO <sub>1</sub> : :
Producing sone depth 1594-1734  Casing: 5 1/2 inch to 159  Perforation: No. of shots  Acid: Gallons from from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained. Date of completion of well  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	94 fort. from to from to Date to Date Barrels water Barrels water Primary alkalinity Secondary alkalinity (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x	SO <sub>1</sub> : :
Casing: 5 1/2 inch to 15 Perforation: No. of shots  Acid: Gellons from from  Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained Date of completion of well Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	94 fort. from to from to Date to Date Barrels water Barrels water Primary alkalinity Secondary alkalinity (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x	SO <sub>1</sub> : :
Perforation: No. of shots	from to from to Data  to Data  to Data  Barrels water  Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	SO <sub>4</sub> : :
Acid: Gallons from from from Initial production: Barrels oil Present production: Barrels oil Place where sample was obtained.  Date of completion of well Properties of reaction in percent: Primary salinity Secondary salinity r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl) Constituents  Ppm.	from to Data to Data to Data Barrels water Barrels water Primary alkalinity Secondary alkalinity ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values Ppm. %	SO <sub>4</sub> : :
Acid: Gallons from from from  Initial production: Barrels oil  Present production: Barrels oil  Place where sample was obtained Date of completion of well  Properties of reaction in percent:  Primary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	to Data to Data to Data Barrels water Barrels water Primary alkalinity Secondary alkalinity ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values Ppm. %	SO <sub>1</sub> : :
Initial production: Barrels oil.  Present production: Barrels oil.  Place where sample was obtained.  Date of completion of well.  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	Barrels water Barrels water Primary alkalinity Secondary alkalinity ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values Ppm. %	SO <sub>1</sub> : :
Present production: Barrals oil  Place where sample was obtained  Date of completion of well  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
Present production: Barrals oil  Place where sample was obtained  Date of completion of well  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	Barrels water  Primary alkalinity  Secondary alkalinity  ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values  Ppm. %	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
Place where sample was obtained.  Date of completion of well.  Properties of reaction in percent:  Primary salinity	Primary alkalinity	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
Date of completion of well  Properties of reaction in percent:  Primary salinity  Secondary salinity  r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppen.	Primary alkalinity Secondary alkalinity ; (r CO <sub>2</sub> + r HCO <sub>2</sub> ) x  12. Reacting values Ppm. %	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
Primary salinity	Secondary alkalinity	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
Secondary salinity	Secondary alkalinity	SO <sub>1</sub> : ::  13. Hypothet. combination Ppm
r SO <sub>4</sub> in (r SO <sub>4</sub> + r Cl)  Constituents  Ppm.	12. Reacting values Ppm. %	SO <sub>1</sub> : :
Constituents Ppm.	12. Reacting values Ppm. %	13. Hypothet. combination Ppm
Ppm.	Ppea. %	Ppm
	Alkalies:	KNO
	A1	
	r Na	KCI
• • • • • • • • • • • • • • • • • • • •	t K	K.SO.
· · · · · · · · · · · · · · · · · · ·	r NH.	K <sub>0</sub> CO <sub>0</sub>
(	Alk. earthe:	•
<b>)</b>	r Ca	NaCl
a-vol	r Mg	Na <sub>6</sub> SO <sub>4</sub>
	Total	Na <sub>2</sub> CO <sub>3</sub>
1	Strong acids:	NH <sub>6</sub> NO <sub>6</sub>
1	* Cl	(NHJ) SO.
12,090	r NO	(NH.)-00.
)	Week acids:	Mg(NOs)a.
	r CO	MrCL
Χα	r HCOs	MrSO.
e CO	Total	McCO.
S		CaCl <sub>a</sub>
O, (unfiltered)	14. pH	CaSO
	<u> </u>	CaCO <sub>8</sub>
		8iO <sub>1</sub>
tal solids 22,706		Fe <sub>2</sub> O <sub>6</sub>
	(c) Turbidity Black Sediment	ALO
Condition of sample:	(d) Oil present?HO	MaO
(a) Color_ Colorless	(e) Necessary to filter? F28	Non-vol
(b) Odor Strong HoS	(f) Container 1 Gal. glass jar	Total

mple No. 1 9-17-6	STATE GEOLOGICAL SURVEY	Lab. No. B-1756
equest No. 9040	URBANA, ILLINOIS	County Champaign
oject No	REPORT OF BRINE ANALYSIS	Index No
T B Marin		Tuscola (las Storis
alysis requested by WeFa MCCN	er Co. #1, Arnold Koss 497'S 159'E,	. We corner NE SE. Char
mple of Brine 21	Prom W W N Range 8 E	-%
	ADSOLUTION OF THE PARTY OF THE	_
lected by W. F. Meents	Data 1-11-62 at well	
	Pool Tuscela Gas Storage	Area
ARnold Koss	la_1Sur. elev	
•	•	
Formation Send - St. Pe		_
		Present depth 1804
. Casing: <u>58 1/2</u> inch to		
. Perforation: No. of shots		<b>.</b>
	toa	•
. Acid: Chilona from	Dete	
		<del></del>
	Berrols water	
	Barrels water.	
Place where sample was obtained	i fam 11 1062	<del></del>
. Date of completion of well		<del> </del>
Properties of reaction in percent:	•	
	Primary alkalinity	
	Secondary alkalinity.  ; (r CO <sub>2</sub> + r HCO <sub>3</sub> ) = 8	
Constituents Ppm.	12. Reacting values	13. Hypothet. combination
	Ppm. %	Ppm.
Harris Commence		KNO:
••••••••••••••••••••••••••••••••••••••	r Na	K-SO <sub>4</sub>
	r K.	K-CO.
		NaNOs
		NaCl
O <sub>k</sub>	f Ca	Na <sub>4</sub> SO <sub>4</sub>
	r Mg	Na <sub>2</sub> CO <sub>2</sub>
Δ	Strong acids:	NHNO
A	£ \$04	NH.Cl
)4	r Cl	(NH <sub>4</sub> ) <sub>5</sub> SO <sub>4</sub>
10,640	r NO.	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>2</sub>
Da	Weak acide:	Mg(NO <sub>2</sub> )
)	r CO.	MgCl <sub>2</sub>
<b>7</b>	r HCO.	MeSO.
Υ		MrCO
	Total	
so CO <sub>1</sub>	Total	CaCla
so CO <sub>k</sub>		
so CO <sub>k</sub>	14. pH	Ca.9O4
S		CaSO <sub>1</sub>
S	14. pH	CaSO <sub>4</sub>
S	14. pH	CaSO <sub>4</sub>
so CO <sub>b</sub>	(c) Turbidity Slight	CaSO <sub>4</sub>
tal solids. 19,606.  Condition of sample:	(c) Turbidity slight (d) Oil present? EO	CaSO <sub>4</sub>
tal solids. 19,606  Condition of sample: (a) Colorless	(c) Turbidity #light (d) Oil present? EO (a) Necessary to filter? Yes	CaCla. CaSO4. CaCO9. 8iO3. PeyO4. Al4O4. MaO Non-vol.
tal solids. 19,606  Condition of sample:	(c) Turbidity #light (d) Oil present? EO (a) Necessary to filter? Yes	CaSO <sub>4</sub>
o CO <sub>2</sub>	(c) Turbidity #light (d) Oil present? EO (a) Necessary to filter? Yes	CaSO <sub>4</sub>
5. Condition of sample:  (a) Color	(c) Turbidity_Slight (d) Oil present?	CaSO <sub>4</sub>

: